



# M74HC125

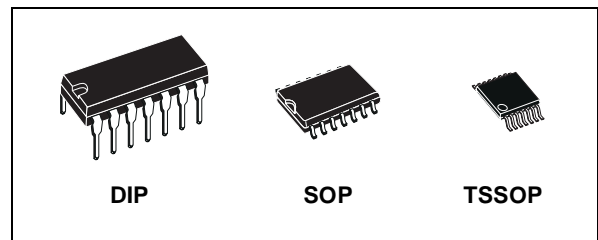
## QUAD BUS BUFFER (3-STATE)

- HIGH SPEED:  
 $t_{PD} = 8ns$  (TYP.) at  $V_{CC} = 6V$
- LOW POWER DISSIPATION:  
 $I_{CC} = 4\mu A$  (MAX.) at  $T_A = 25^\circ C$
- HIGH NOISE IMMUNITY:  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 6mA$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \approx t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH  
74 SERIES 125

### DESCRIPTION

The M74HC125 is an high speed CMOS QUAD BUFFER (3-STATE) fabricated with silicon gate C<sup>2</sup>MOS technology.

The device requires the 3-STATE control input  $\overline{G}$  to be set high to place the output into the high impedance state.

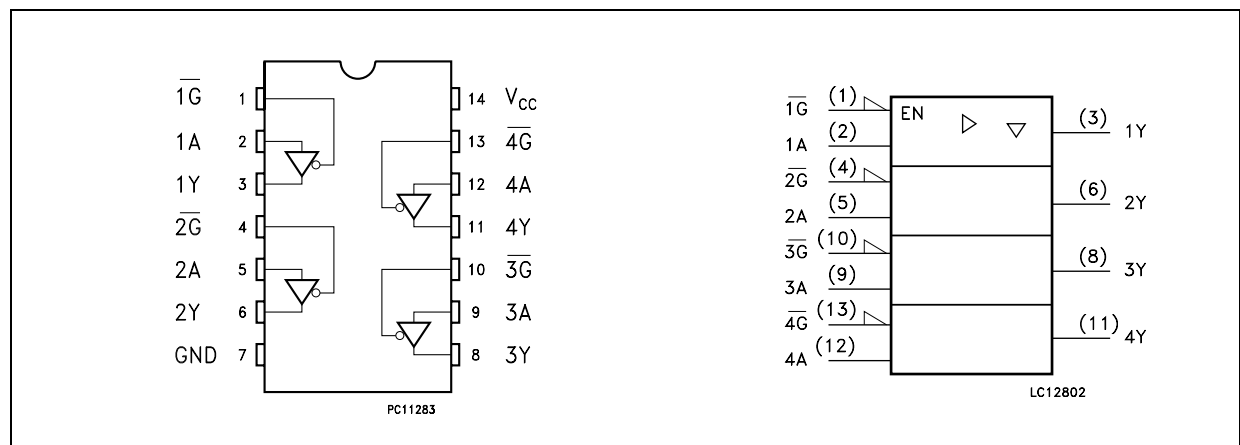


### ORDER CODES

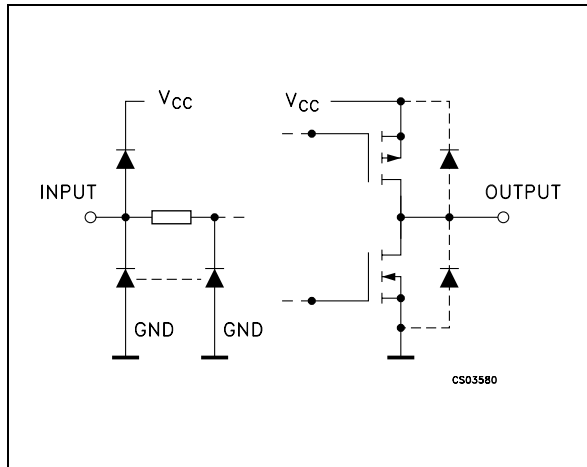
PACKAGE	TUBE	T & R
DIP	M74HC125B1R	
SOP	M74HC125M1R	M74HC125RM13TR
TSSOP		M74HC125TTR

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



## INPUT AND OUTPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 4, 10, 13	$\overline{1G}$ TO $\overline{4G}$	Output Enable Input
2, 5, 9, 12	1A TO 4A	Data Inputs
3, 6, 8, 11	1Y TO 4Y	Data Outputs
7	GND	Ground (0V)
14	$V_{CC}$	Positive Supply Voltage

## TRUTH TABLE

A	$\overline{G}$	Y
X	H	Z
L	L	L
H	L	H

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	-0.5 to +7	V
$V_I$	DC Input Voltage	-0.5 to $V_{CC} + 0.5$	V
$V_O$	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	V
$I_{IK}$	DC Input Diode Current	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 20$	mA
$I_O$	DC Output Current	$\pm 35$	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current	$\pm 70$	mA
$P_D$	Power Dissipation	500(*)	mW
$T_{stg}$	Storage Temperature	-65 to +150	°C
$T_L$	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

(\*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	2 to 6	V
$V_I$	Input Voltage	0 to $V_{CC}$	V
$V_O$	Output Voltage	0 to $V_{CC}$	V
$T_{op}$	Operating Temperature	-55 to 125	°C
$t_r, t_f$	Input Rise and Fall Time	$V_{CC} = 2.0V$	0 to 1000
		$V_{CC} = 4.5V$	0 to 500
		$V_{CC} = 6.0V$	0 to 400

## DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value							Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C			
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V <sub>IH</sub>	High Level Input Voltage	2.0		1.5			1.5		1.5		V	
		4.5		3.15			3.15		3.15			
		6.0		4.2			4.2		4.2			
V <sub>IL</sub>	Low Level Input Voltage	2.0				0.5		0.5		0.5	V	
		4.5				1.35		1.35		1.35		
		6.0				1.8		1.8		1.8		
V <sub>OH</sub>	High Level Output Voltage	2.0	I <sub>O</sub> =-20 μA	1.9	2.0		1.9		1.9		V	
		4.5	I <sub>O</sub> =-20 μA	4.4	4.5		4.4		4.4			
		6.0	I <sub>O</sub> =-20 μA	5.9	6.0		5.9		5.9			
		4.5	I <sub>O</sub> =-6.0 mA	4.18	4.31		4.13		4.10			
		6.0	I <sub>O</sub> =-7.8 mA	5.68	5.8		5.63		5.60			
V <sub>OL</sub>	Low Level Output Voltage	2.0	I <sub>O</sub> =20 μA		0.0	0.1		0.1		0.1	V	
		4.5	I <sub>O</sub> =20 μA		0.0	0.1		0.1		0.1		
		6.0	I <sub>O</sub> =20 μA		0.0	0.1		0.1		0.1		
		4.5	I <sub>O</sub> =6.0 mA		0.17	0.26		0.33		0.40		
		6.0	I <sub>O</sub> =7.8 mA		0.18	0.26		0.33		0.40		
I <sub>I</sub>	Input Leakage Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			± 0.1		± 1		± 1	μA	
I <sub>OZ</sub>	High Impedance Output Leakage Current	6.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND			± 0.5		± 5		± 10	μA	
I <sub>CC</sub>	Quiescent Supply Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			4		40		80	μA	

**AC ELECTRICAL CHARACTERISTICS** (Input  $t_r = t_f = 6\text{ns}$ )

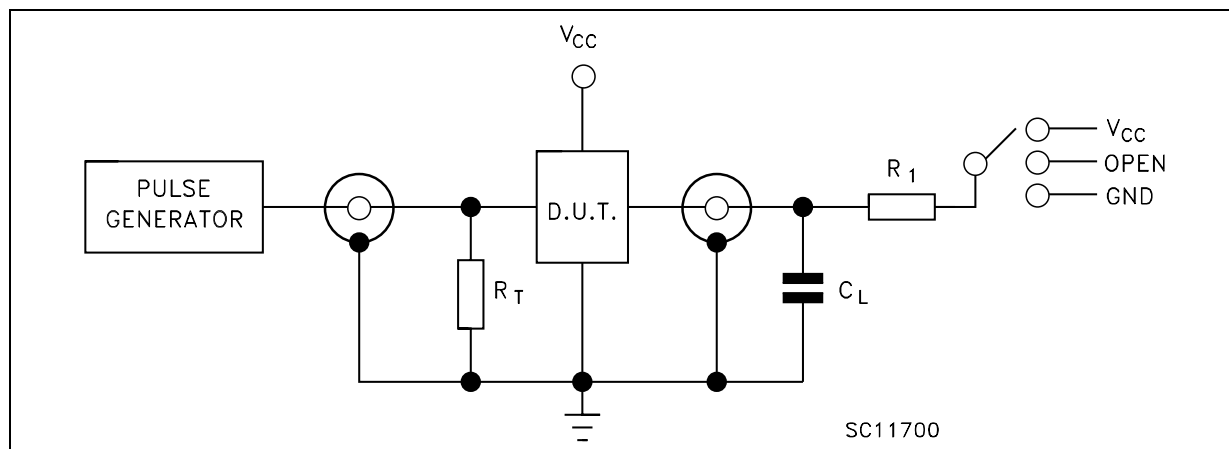
Symbol	Parameter	Test Condition			Value							Unit
		V <sub>CC</sub> (V)	C <sub>L</sub> (pF)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time	2.0	50			20	60		75		90	ns
		4.5				6	12		15		18	
		6.0				5	10		13		15	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time	2.0	50			36	75		95		110	ns
		4.5				9	15		19		22	
		6.0				8	13		16		19	
		2.0	150			52	105		130		160	ns
		4.5				13	21		26		32	
		6.0				11	18		22		27	
		t <sub>PZL</sub> t <sub>PZH</sub>	High Impedance Output Enable Time	2.0	50	R <sub>L</sub> = 1 KΩ		36	75		95	
4.5				9			15		19		22	
6.0				8			13		16		19	
2.0	150			R <sub>L</sub> = 1 KΩ		52	105		130		160	ns
4.5						13	21		26		32	
6.0						11	18		22		27	
t <sub>PLZ</sub> t <sub>PHZ</sub>	High Impedance Output Disable Time	2.0	50	R <sub>L</sub> = 1 KΩ		48	80		100		120	ns
		4.5				12	16		20		24	
		6.0				10	14		17		20	

**CAPACITIVE CHARACTERISTICS**

Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
C <sub>IN</sub>	Input Capacitance	5.0			5	10		10		10	pF
C <sub>PD</sub>	Power Dissipation Capacitance (note 1)	5.0			35						pF

1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$  (per buffer)

## TEST CIRCUIT

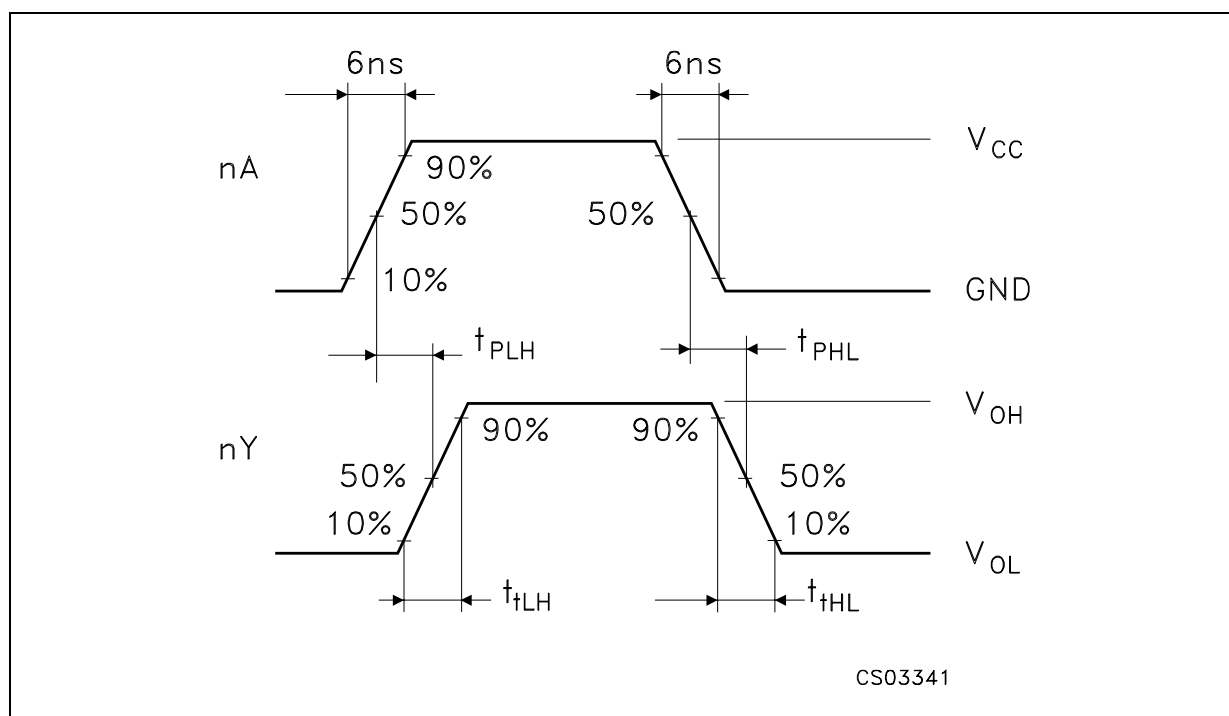


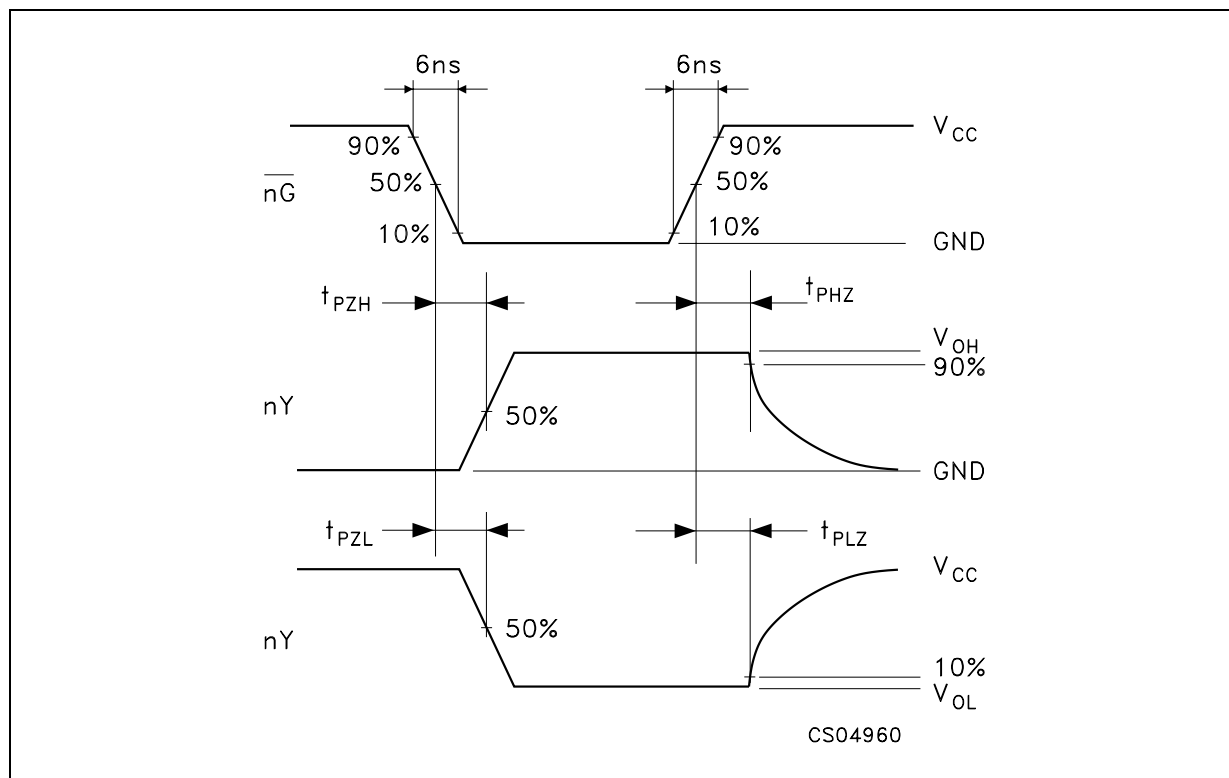
TEST	SWITCH
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PZL}$ , $t_{PLZ}$	$V_{CC}$
$t_{PZH}$ , $t_{PHZ}$	GND

$C_L$  = 50pF/150pF or equivalent (includes jig and probe capacitance)

$R_1$  = 1K $\Omega$  or equivalent

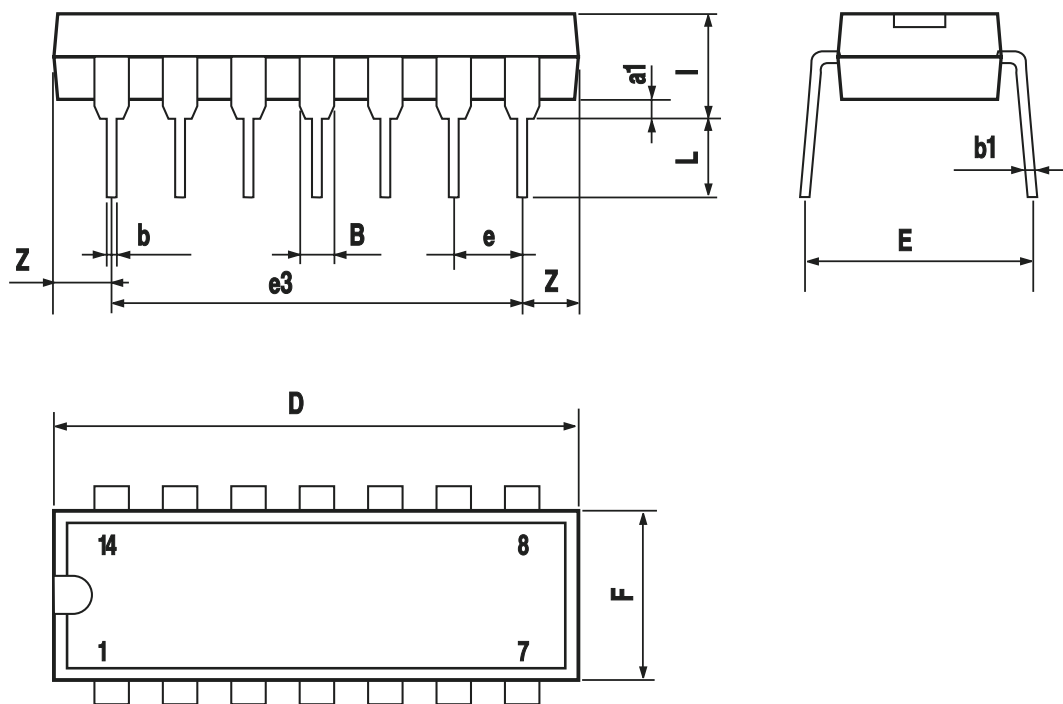
$R_T$  =  $Z_{OUT}$  of pulse generator (typically 50 $\Omega$ )

WAVEFORM 1 : PROPAGATION DELAY TIMES ( $f=1\text{MHz}$ ; 50% duty cycle)

**WAVEFORM 2 : OUTPUT ENABLE AND DISABLE TIMES** ( $f=1\text{MHz}$ ; 50% duty cycle)

## Plastic DIP-14 MECHANICAL DATA

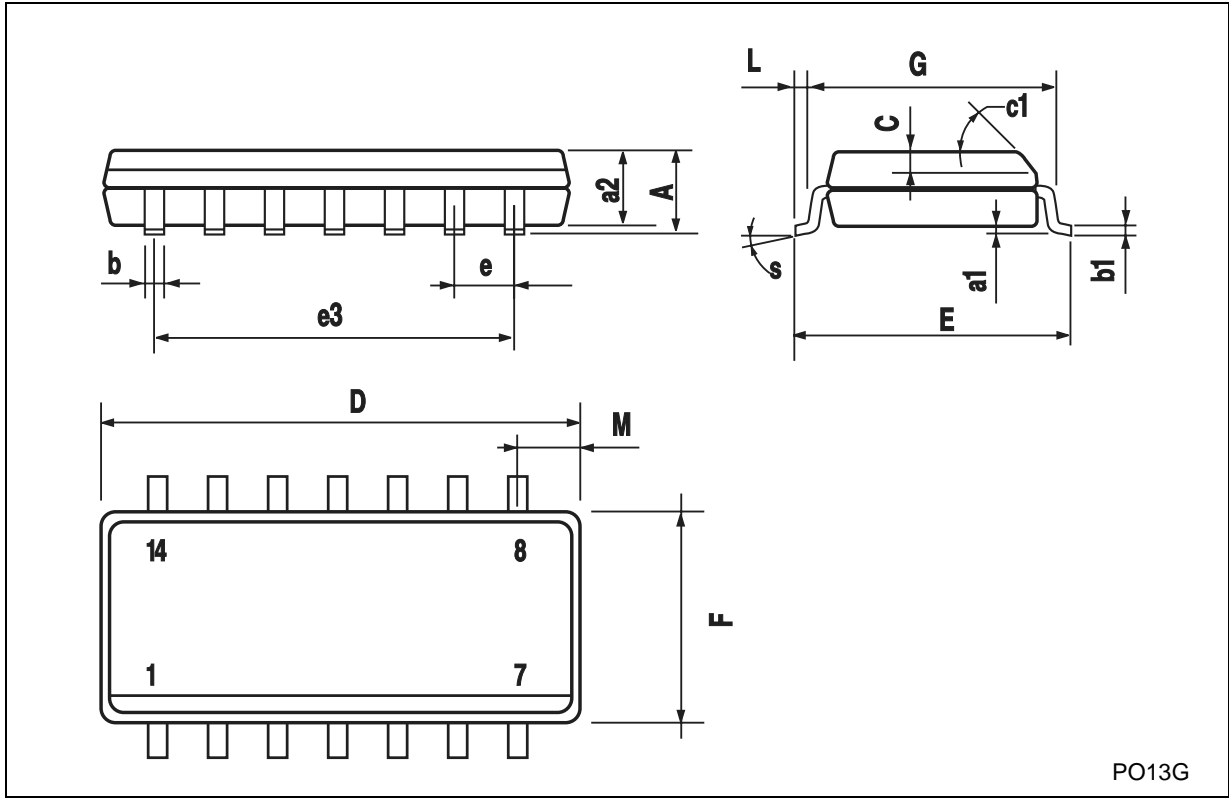
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



P001A

SO-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8° (max.)					



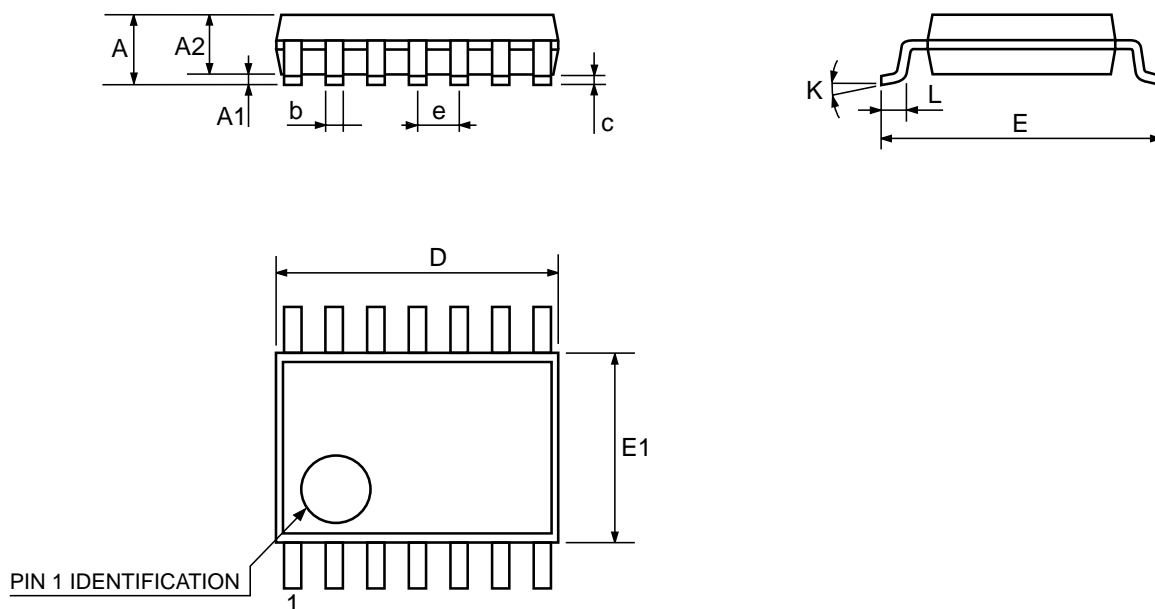
PO13G





## TSSOP14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030



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